

Social Context and Psychosocial Influences on Blood Pressure Among American Samoans

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ABSTRACT This study explores social and economic influences on health within a model formulated to address explicitly both individual and household level phenomena. Dressler's lifestyle incongruity model is used as a basis from which to predict the effects of intracultural contexts of variability on blood pressure. The sample for this survey consists of 134 Samoan men and women living in American Samoa. Based on previous experience and ethnographic sources, two key intracultural contexts were examined: gender, i.e., male-female differences in response to psychosocial stress, and household employment as indicated by whether or not both spouses in a household are employed. Our analysis indicates that lifestyle incongruity, defined as the difference between the material culture presented by a household and the economic resources of the family, is significantly associated with both systolic and diastolic blood pressure. Furthermore, males and females show opposite blood pressure associations with both lifestyle incongruity (male blood pressure increases with increasing incongruity while female blood pressure does not) and household employment (male blood pressure is higher when both spouses work but female blood pressure is lower). *Am J Phys Anthropol* 103:7-18, 1997. © 1997 Wiley-Liss, Inc.

In the twentieth century, an increasingly homogeneous world culture promoted by expanding technologies and the interdigitation of economies is bringing dramatic change to the lives of people in developing societies. Many workers have attempted to inject a perspective from political economy into issues of human biology in developing contexts (e.g., Leatherman and Goodman, 1997). One of the difficulties inherent in such a perspective is the complexity of the articulation of interacting effects between the world economy, the community, the household, and the individual. One method for investigating such interactions is the use of the lifestyle incongruity model (Dressler, 1991, 1995; Bindon and Dressler, 1992; Bin-

don, 1997; Dressler and Bindon, 1997). As with other models assessing the association between behavioral stress and blood pressure, the fundamental assumption is that there is a small chronic excitation of the sympathetic nervous system, which over time produces cardiovascular symptoms. The lifestyle incongruity model was chosen for this study over competing models of stress effects on blood pressure because many of

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the other models are population specific and/or focus on individual behaviors or personality attributes, such as John Henryism, which is personality based and focuses on African-Americans (James et al., 1983). Another alternative, the job strain approach to stress (Theorell and Karasek, 1996) explicitly considers one cultural context (occupation), but remains focused on the individual, largely ignores household and community cultural contexts, and is inappropriate for many anthropological populations. By contrast, the lifestyle incongruity model uses concepts derived from social theory (Weber, 1946) to operationalize stress as the discrepancy between an individual's style of life and household economic resources (Bindon and Dressler, 1992). Both factors constituting incongruity (lifestyle and economic resources) contain influences from the individual to the household to the community to the world economy, thus clearly locating the individual within his or her cultural matrix. Additionally, the emphasis on material culture in the lifestyle incongruity model retains and updates notions about culture that are well grounded in anthropological theory. Finally, as noted in the recent review by Dressler (1995), this model has been found to be useful for understanding health-related effects of lifestyle stress in numerous cultural contexts in many different societies.

American Samoa is one place where the social and biological impacts of economic development have been both rapid and dramatic (Baker, 1986; McGarvey and Schendel, 1986; McGarvey et al., 1989). The purpose of this paper is to use a lifestyle incongruity model to examine the relationship between sociocultural factors and blood pressure in American Samoans. In particular, it is our intent to investigate various aspects of the household in American Samoa as they relate to attempts to acquire and manifest modern lifestyles. The crux of the research hypothesis is that the effects of specific sociocultural variables on blood pressure vary intraculturally.

Aside from a full employment period during World War II, relatively few jobs were available in American Samoa prior to the 1960s. Since that time, the government and tuna canneries have become the major em-

ployers accounting for 33 and 34% of 1990 jobs, respectively. According to the CIA Factbook (<http://www.odci.gov/cia/publications/95fact/aq.html>) 1991 unemployment for American Samoa was 12%. There have been an increasing number of women participating in the labor force over the past two decades. Whereas, traditionally, the main task of women centered around caring for the family in the household, over a third of American Samoan women have been in the work force since the 1970s. As more and more women have taken jobs outside the home, the number of people per household has decreased with fewer people living in traditional extended family households (Holmes and Holmes, 1992).

In Samoa, men and women have very different roles in the social system. In traditional Samoan society the goal of most Samoan men is to be elected to head the extended family and receive the associated *matai* (chief) title. It is then his responsibility to administer family lands and property, settle domestic disputes, coordinate the household labor force, and promote family unity and maintain prestige (Holmes and Rhoads, 1983). A woman's primary role in traditional Samoan society is as wife and childbearer. A woman's status reflects the rank of her husband's *matai* title. Conversely, the wife must support her husband's status in the village by maintaining the cleanliness and order of the household compound and contributing to the overall appearance of the village (Shore, 1982).

These differences in traditional gender roles lead to expectations that men and women will be affected dissimilarly by lifestyle stress. In his study of Samoan migrants to the San Francisco Bay Area, Janes (1990) demonstrated that men and women experience the stresses of migration and social change differently. He reported that discrepancy between social status and economic resources was significantly associated with blood pressure for men, but not for women. For Samoan women, family stressors were related to blood pressure, but this was not the case for men (Janes, 1990). In a similar vein, Dressler and Bindon (1997) demonstrated that the association between age, lifestyle incongruity, and blood pressure

is reversed for men and women in American Samoa. They illustrated opposite blood pressure associations with lifestyle incongruity by husbands and wives in the same households. In summary, we expect Samoan men and women to show different blood pressure responses to lifestyle incongruity on both ethnographic and empirical bases.

In this research we also wish to explore the impact of female participation in the work force on psychosocial stress as operationalized by the lifestyle incongruity model. We expect the variability in intracultural context between households where both spouses work outside the home vs. those where no more than one spouse is employed to have an impact on how lifestyle incongruity is associated with the blood pressures of men and women.

SUBJECTS AND METHODS

Sample and measures

Research was conducted on the island of Tutuila, the largest and most populous island of American Samoa, during July and August 1992. The population of American Samoa was reported as 46,773 for the 1990 census (American Samoa, 1992). Of that total, 45,043 resided in the 57 villages of Tutuila, comprising 6,334 households. For this study, 135 Samoan adults between the ages of 37 and 81 representing 135 different households in 22 villages from all geographic areas of the island of Tutuila, American Samoa, completed the interviews and measurements necessary for this analysis. Of this total, one woman was excluded after an analysis of influential cases indicated that her outlier values for both blood pressure and lifestyle incongruity significantly altered the regression analysis. The resulting sample, comprised of 69 men and 65 women, constitutes just over 2% of the households on Tutuila. It was our intent to purposively sample on the basis of age, sex, and 1976 blood pressure (systolic <140 and diastolic <90 vs. systolic ≥ 140 or diastolic ≥ 90) from individuals who had been originally seen in 1976 by the senior author, as was done in an earlier, smaller survey focusing only on men (Bindon et al., 1991; Bindon and Crews, 1993). However, in order to increase the sample to meet the needs of the

genetic component of the research protocol (reported on elsewhere), additional participants were recruited opportunistically through the Public Health Nurses and key informants.

Since the final sample is neither structured nor random, it is especially important to compare sample characteristics to the overall population to highlight potential bias and how the biases might impact on generalizations from our analysis. Table 1 presents several relevant characteristics of the 134 individuals and households sampled as compared to values for the population of American Samoa based on the 1990 census (American Samoa, 1992). Educational characteristics of the survey sample are comparable to those for the population, with both reporting 40–50% of individuals with high school diploma or more schooling. Fewer women were employed, more men were employed, and more households had two or more wage earners in the survey than in the census. This set of differences between the survey and census is not as paradoxical as seems at first glance. It is quite common for a second wage earner in addition to the male head of household to be an adult child or niece or nephew as part of the extended family. In spite of the employment differences noted above, estimated household income was comparable for the survey and the census. The number of persons per household is also similar for the survey and census. Median household size in the survey was seven individuals with a range from two to twenty.

Seated blood pressure was measured after subjects had been resting at least 10 minutes. Blood pressure was measured using an aneroid sphygmomanometer with either a standard or thigh cuff (for very large arms) on the right arm of the subject. A stethoscope was used to establish systole as the initiation of Korotkow sounds (phase 1) and diastole as the cessation of Korotkow sounds (phase 5). If the subject was seated on the floor, as frequently happened, they were instructed to extend, rather than fold their legs, during the measurement of blood pressure. Blood pressure was measured three times, with the cuff completely evacuated and recovery allowed between readings. The

TABLE 1. *Sample characteristics compared to the 1990 Census*

Characteristics	1992 Survey	1990 Census
High school graduate or higher education ¹	42.3%	48.5%
Women employed ¹	34.1%*	45.6%*
Men employed ¹	76.8%*	67.3%*
Average number of persons per household ²	7.8	7.0
Households with 2 or more wage earners ²	72.6%*	61.2%*
Average household income ^{2,3}	\$16,192	\$16,114

¹ Value from census includes only individuals age 35 or over.

² Value from census is for total population, not restricted to age 35 and above.

³ Income for 1992 survey estimated from midpoint of income categories.

* $P \leq 0.05$.

average of these three readings was calculated and is used in this analysis as the dependent variables systolic and diastolic blood pressure. The triceps skinfold was measured at the mid point on the back of the right upper arm with a Lange skinfold caliper, following standard techniques (Harrison et al., 1988). Three readings were taken and the average value recorded in the data file.

Social, economic, health, activity, and lifestyle data were obtained by interview. Interviews were conducted in English, but there was always a team member or nurse present to assist if language difficulties were encountered. Such problems were minimal. Birth date was asked, and record data was available for checking on age of the subjects. Information about physical activity was ascertained from responses to questions about the level of physical activity at work (whether for wages or for the household; answers ranged from 1 = very light, mostly sitting and lying down to 5 = very heavy, standing with walking and carrying loads), frequency of vigorous aerobic exercise, and frequency of less strenuous exercise (the frequency responses ranged from 1 = none to 3 = three or more times per week). The answers to these items were summed to produce an overall index of activity.

Interviews also provided information from which main effect variables were derived. Lifestyle incongruity is a measurement of the degree to which style of life exceeds socioeconomic status. Style of life is mea-

sured by a scale of ownership of common consumer goods such as a telephone or car, exposure to mass media information sources including TV-watching, travel, and membership in social organizations. Items with item-total correlation values of less than 0.15 were eliminated from the scale. The resulting 20-item scale with mean values and item-total correlation is presented in Table 2. A reliability analysis for internal consistency was performed and the scale shows very acceptable consistency as indicated by the Chronbach's alpha of 0.74 (this statistic reaches 1.0 when all items show perfect item-total correlation).

Socioeconomic status was calculated from a factor analysis of four variables: subject's and spouse's occupational status on a six-point scale (from unemployed to executive level professional), subject's years of education, number of wage earners in household, and household annual income on a six-point scale. The factor analysis of these variables is presented in Table 3. Two factors accounting for 75% of the variability in the variables were derived. Factor scores were calculated using the regression method and a total score was derived by summing both factor scores for a single household index of economic resources.

To achieve metric comparability, the two component scales of lifestyle incongruity (style of life and economic resources) were converted to a mean of 50 and a standard deviation of 10. The lifestyle incongruity variable was then calculated by subtracting economic resources from style of life. The resulting lifestyle incongruity scores have a mean of 0.15 and a standard deviation of 10.1, and range from -22.4 to +25.7. Negative scores indicate individuals whose socioeconomic resources exceed their style of life; scores around zero indicate relative equality on the two scales; and positive scores indicate a lifestyle which exceeds resources (Dressler, 1991).

The employment status of the household head and spouse has been treated as a dichotomous variable: both spouses working vs. one or neither spouse working. To avoid confusion with occupational status, which ranks job titles on a status scale, this indicator of

TABLE 2. *Style of life scale*¹

Item	Score	%	Value label	Item-total correlation
No. of rooms	0	10.4	One room	0.24
	1	89.6	More than one room	
Type of flooring	0	14.9	Dirt, wood, concrete	0.32
	1	85.1	Tile, linoleum	
Indoor plumbing	0	38.8	No	0.21
	1	61.2	Yes	
Phone	0	24.6	No	0.23
	1	75.4	Yes	
Color TV	0	10.4	No	0.48
	1	89.6	Yes	
Stereo	0	59.7	No	0.23
	1	40.3	Yes	
VCR	0	36.6	No	0.43
	1	63.4	Yes	
Microwave	0	79.1	No	0.15
	1	20.9	Yes	
Air-conditioner	0	94.8	No	0.21
	1	5.2	Yes	
Couch	0	29.9	No	0.26
	1	70.1	Yes	
Car	0	73.9	No	0.24
	1	26.1	Yes	
Pickup truck	0	60.4	No	0.23
	1	39.6	Yes	
Travel to Western Samoa	0	28.4	None in past two years	0.23
	1	46.3	1–2 times past two years	
	2	17.9	3–4 times past two years	
	3	7.4	5+ times past two years	
Read newspapers	0	23.1	0 times per week	0.17
	1	23.9	1–2 times per week	
	2	3.7	3–4 times per week	
	3	49.3	5+ times per week	
U.S. TV news	0	26.1	0 times per week	0.52
	1	17.2	1–2 times per week	
	2	6.7	3–4 times per week	
	3	50.0	5+ times per week	
Samoan TV news	0	15.7	0 times per week	0.58
	1	17.2	1–2 times per week	
	2	3.7	3–4 times per week	
	3	63.4	5+ times per week	
Read news magazines	0	70.1	0 times per month	0.38
	1	20.1	1–2 times per month	
	2	6.1	3–4 times per month	
	3	3.7	5+ times per month	
Read books	0	22.4	0 books per year	0.27
	1	42.5	1–2 books per year	
	2	8.2	3–4 books per year	
	3	26.9	5+ books per year	
Movies (or rent a video)	0	28.4	0 times per month	0.41
	1	20.9	1–2 times per month	
	2	8.2	3–4 times per month	
	3	42.5	5+ times per month	
Watch TV	0	16.4	0 hours per day	0.39
	1	57.5	1–2 hours per day	
	2	16.4	3–4 hours per day	
	3	9.7	5+ hours per day	

¹ Cronbach's standardized item alpha = 0.76. Scale mean \pm s.d. = 18.13 \pm 6.12.

employment status of the spouses is referred to as household employment.

An overall measure of wealth referred to as socioeconomic rank was calculated as the sum of style of life and socioeconomic status. This produces a variable which indicates aggregate socioeconomic status and which is or-

thogonal to the lifestyle incongruity variable (Dressler, 1991). This variable is used as a control for overall socioeconomic status effects.

Data analysis

On the basis of previous experience and published Samoan ethnography, both gen-

TABLE 3. Varimax-rotated factor loadings for household economic resources

Variable	Factor One	Factor Two
Household occupational class	0.784	0.116
Number of wage earners	-0.158	0.924
Educational level of subject	0.813	-0.126
Income category	0.572	0.686
Eigen value	1.807	1.198
Percent of variance	44.1	30.5

der and household employment status were anticipated to exert important modifying influences on lifestyle incongruity. The addition of these contextual effects to the basic lifestyle incongruity model generates the following analytic model:

$$Y = a + b_1x_1 + b_2x_2 + b_3x_3 + b_4(x_5 + x_6) + b_5x_4 + b_6(x_5 - x_6) + b_7x_7 + b_8x_4(x_5 - x_6) + b_9x_7x_4 + b_{10}x_7(x_5 - x_6) + \epsilon.$$

In this model, Y stands for the dependent variable, systolic or diastolic blood pressure. The independent variables include x_1 , which is age, x_2 is the triceps skinfold measurement, x_3 is the activity index, x_4 is sex, x_5 represents lifestyle, and x_6 represents household economic resources. The sum of these two terms ($x_5 + x_6$) is the aggregate socioeconomic resources measure, referred to in this analysis as socioeconomic rank, and the difference of the two terms ($x_5 - x_6$) is the lifestyle incongruity calculation. The other terms include x_7 for household employment, and then the interaction terms, formulated in standard General Linear Model format as the product of two or more lower level effects. These include: $x_4 \cdot (x_5 - x_6)$, which is calculated for each subject as the value of sex (0 or 1) times the value of lifestyle incongruity, and termed the sex by lifestyle incongruity interaction; $x_7 \cdot (x_5 - x_6)$ is the household employment by lifestyle incongruity interaction. A significant two-way interaction term means one of the variables has a different response curve for varying levels of the other variable. For example, in the current study, if the sex by lifestyle incongruity interaction term is statistically significant, that would mean that the blood pressure effects of lifestyle incongruity are different for men and for women. This analytic model was proposed with least squares multiple

regression in mind as the statistical procedure to evaluate the model, and the REGRESSION procedure in SPSS was used to perform the actual calculations. Three blocks of variables were entered hierarchically into the regression equation: first, the covariates (age, triceps skinfold, activity, and socioeconomic rank), next, the main effects (sex, lifestyle incongruity, and household employment), and finally the three two-way interactions between the main effects.

RESULTS

Descriptive statistics for all variables included in the analysis are shown in Table 4 for the total sample. Mean systolic blood pressure for the total sample was 145.7 mm Hg and mean diastolic pressure was 86.1 mm Hg. The relatively high average blood pressures were expected in part due to the high mean age of 56 years for the sample and in part due to the high levels of obesity in American Samoa (Bindon, 1995). Mean blood pressures were not significantly different for men and women. The mean triceps skinfold, however, did differ significantly by sex with women averaging a measurement over 20 mm higher than men. Socioeconomic rank and activity level also differed for the men and women with men having higher socioeconomic and activity scores than women.

Households with both husband and wife employed comprised 23% of the total sample; 46% were households with either husband or wife employed (in 78% of these it was the husband who was employed); and 31% were households where neither husband nor wife was employed. A total of 17% of the subjects interviewed were widowed, divorced, or never married.

Beta coefficients (standardized regression coefficients) and summary statistics from the regression analyses for systolic and diastolic blood pressure are shown in Table 5. The R^2 for the systolic regression was 0.161 and for the diastolic regression 0.149, both significantly greater than 0 at $P \leq 0.05$. The regression coefficients are divided into covariates, main effects, and interaction terms reflecting the entry order into the regression calculations. Significant associations (indicated by a coefficient significantly different

TABLE 4. Descriptive statistics for variables used in the regression model

Variable	Men (N = 69)		Women (N = 65)		Total (N = 134)	
	Mean	s.d.	Mean	s.d.	Mean	s.d.
Systolic blood pressure (mm Hg)	143.1	21.7	148.6	25.6	145.7	23.7
Diastolic blood pressure (mm Hg)	87.0	13.8	85.1	14.9	86.1	14.3
Triceps skinfold (mm)	25.6***	12.2	46.2***	13.0	35.6	16.2
Age (years)	55.9	8.7	56.8	8.4	56.3	8.5
Socioeconomic rank	102.7*	17.7	96.5*	15.5	100.0	17.2
Activity level	7.4**	1.8	6.5**	1.4	7.0	1.7
Lifestyle incongruity	-0.2	10.8	0.5	9.5	0.0	10.3
Both spouses employed (%)	26.1		20.0		23.1	

* $P \leq 0.05$, ** $P \leq 0.01$, *** $P \leq 0.001$, differences between men and women.

from zero at $P \leq 0.05$) between the covariates and blood pressure include age, which is positively associated with systolic blood pressure, and triceps skinfold, which is positively associated with diastolic blood pressure. Of the main effects, household employment is significantly associated with systolic blood pressure in such a way that individuals have higher blood pressure if they live in a household with both spouses employed, whereas sex is significantly associated with diastolic blood pressure reflecting lower pressures among women. Lifestyle incongruity is significantly associated with both systolic and diastolic blood pressures such that the more incongruous the style of life and economic resources, the higher the blood pressure. Lifestyle incongruity is the only variable in the analysis significantly associated with both blood pressure measurements. The interaction term for household employment by sex is significantly associated with systolic blood pressure as is the interaction term for lifestyle incongruity by sex. These same two interaction terms approach significance for diastolic blood pressure ($0.06 < P < 0.08$), and have exactly the same pattern as for systolic blood pressure.

The patterns of the two significant two-way interaction terms for systolic blood pressure are graphically illustrated in Figure 1. These graphs depict the predicted blood pressure values based on the regressions, setting all variables at their sample mean value except for the interaction variables being evaluated (sex and household employment status for Fig. 1a and sex and lifestyle incongruity for Fig. 1b). Having both spouses employed outside the home has opposite effects on systolic blood pressure for the men

TABLE 5. Standardized regression coefficients (β) for regression of lifestyle influences on systolic and diastolic blood pressure of Samoan adults (N = 134)

Variable	Systolic blood pressure	Diastolic blood pressure
Covariates		
Age	0.244**	-0.021
Triceps skinfold	0.127	0.246*
Activity	-0.028	-0.071
Socioeconomic rank	-0.022	-0.044
Main effects		
Sex	0.134	-0.202*
Lifestyle incongruity	0.271*	0.290*
Household employment	0.281*	0.119
Interactions between main effects		
Lifestyle incongruity \times sex	-0.301**	-0.163
Household employment \times sex	-0.354**	-0.204
Lifestyle incongruity \times household employment	0.086	0.139
R ² (d.f. = 10,123)	0.163*	0.149*

* $P \leq 0.05$, ** $P \leq 0.01$, coefficients tested as significantly different from zero using a one-tailed t-test.

and women in the survey. In households where both spouses are employed, females tend to have lower systolic blood pressures than men by about 23 mm Hg, whereas in households where one or neither spouse is employed, men have lower systolic blood pressures by about 6 mm Hg. Lifestyle incongruity also has opposite associations with systolic blood pressure for the Samoan men and women, with increasing incongruity being associated with higher pressure in men and lower in women. Evaluating the regression at one standard deviation below the mean value of lifestyle incongruity (low lifestyle incongruity) predicted systolic blood pressure for men is 11 mm Hg lower than for women, while at one standard deviation above mean lifestyle incongruity, predicted blood pressure for men is 11 mm Hg higher than for women.

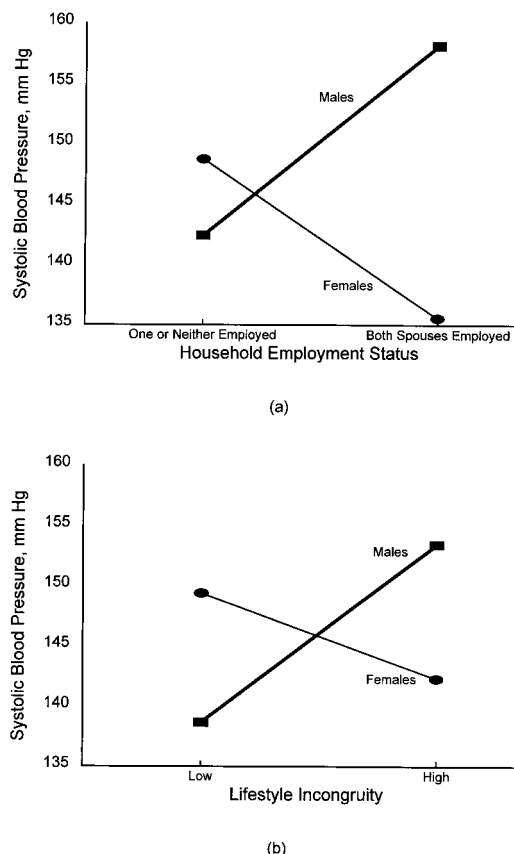


Fig. 1. Plots of significant interaction terms from regression of lifestyle influences on systolic blood pressure of Samoan adults. **a:** Interaction of sex by household employment status for systolic blood pressure. **b:** Interaction of sex by lifestyle incongruity for systolic blood pressure. Sex and household employment status are both dichotomous variables coded as 0 (female; one or neither spouse employed) or 1 (male; both spouses employed). For this graphic evaluation of the regression, lifestyle incongruity is set at one standard deviation below the mean (low LSI) and one standard deviation above the mean (high LSI).

DISCUSSION

Before discussing these results, some limitations affecting interpretation of this study need to be considered. The most serious limitation on this study is a result of the inconsistent sampling techniques. Table 6 presents a comparison of the selected vs. the opportunistic segments of the sample for the key analytic variables. The only significant difference in mean values is the lower systolic blood pressure in the opportunistic sample. While not significantly different,

TABLE 6. Comparison of key variables for the selected and opportunistic samples¹

Variable	Selected (N = 92)		Opportunistic (N = 42)	
	Mean	s.d.	Mean	s.d.
Systolic blood pressure (mm Hg)	148.3*	25.8*	140.2*	17.5*
Diastolic blood pressure (mm Hg)	86.5	14.3	85.2	14.5
Triceps skinfold (mm)	34.7	16.5	37.5	15.6
Age (years)	57.1	6.8**	54.6	11.3**
Socioeconomic rank	99.5	16.8	100.2	17.3
Activity level	7.0	1.7	7.0	1.7
Lifestyle incongruity	0.4	10.2	-0.3	9.9
% Females	48.9		47.6	
% Households both spouses employed	18.5		33.3	

¹ Equal variance t-test was used except when the variance was significantly different (indicated by s.d. in table), where a two sample t-test model with unequal variances was used. Chi-square with one degree of freedom used to test for differences in percentages.

* $P \leq 0.05$.

** $P \leq 0.001$.

the higher percentage of households where both spouses are employed in the opportunistic sample is more representative of the population as indicated by the 1990 census. By combining the two segments, the overall sample characteristics more closely approximate the population as represented in the census and the statistical power is substantially enhanced.

The composite sample, however, differs from the general population of American Samoa as characterized by the 1990 census in key occupational variables including rates of employment among men and women and percent of households with two or more wage earners. While these variables were measured differently in the census and in the survey, the difference in these values, which are central to the analytic model, argue for the results presented here to be treated as preliminary and in need of confirmation on a more systematic and representative sample of the population.

A second problem associated with the sampling technique involves potential bias in the outcome variables. Many participants were told beforehand by the public health nurse that this was a "blood pressure and diabetes survey." Individuals who had been told or suspected they had high blood pressure or high blood sugar may have been more interested in participating, thus bias-

TABLE 7. Comparison of key variables for the 1992 sample to an age-matched segment of the 1976 sample from Tutuila

Variable	1976		1992	
	Mean	s.d.	Mean	s.d.
Men				
Sample size	302		69	
Systolic blood pressure (mm Hg)	137.1*	22.6	143.1*	21.7
Diastolic blood pressure (mm Hg)	88.1	13.3	87.0	13.8
Triceps skinfold (mm)	18.9**	11.0	25.6**	12.2
Age (years)	55.8	8.9	55.9	8.7
Women				
Sample size	304		65	
Systolic blood pressure (mm Hg)	143.8	26.3	148.6	25.6
Diastolic blood pressure (mm Hg)	89.4*	15.4	85.1*	14.9
Triceps skinfold (mm)	39.1**	15.1	46.2**	13.0
Age (years)	56.7	8.1	56.8	8.4

* $P \leq 0.05$.

** $P \leq 0.001$.

ing the sample in favor of individuals with poorer health. To test for potential differences, the sample was compared to an age-matched sample of our larger survey of Tutuila from 1976 (Bindon and Baker, 1985). The results of this comparison are presented in Table 7. The 1992 sample has significantly higher systolic blood pressures for men, significantly lower diastolic blood pressures for women, and significantly higher triceps skinfold measurements for both sexes. The higher systolic blood pressure in the 1992 males is a result of the oversampling of individuals who had systolic blood pressures in excess of 140 mm Hg in 1976 among the selected segment of the sample (see Table 6). These differences in blood pressure between the 1976 and 1992 samples add emphasis to the need for confirmation of our results.

Finally, the regressions account for relatively small portions of the variability in blood pressure overall ($R^2 = 0.16$ and 0.15 for systolic and diastolic blood pressure, respectively). Keeping these potential limitations in mind, there are some interesting aspects of the results that should be considered.

The aim of this study was to test a lifestyle incongruity model of the relationship between sociocultural stressors and blood pressure. Moreover, we were interested in exam-

ining intracultural contexts of variability, focusing on sex and household employment patterns as two salient contextual modifiers based on previous experience and ethnographic sources. Our modified model predicted that men and women would respond to lifestyle incongruity and household employment patterns differently. Our results indicate that lifestyle incongruity is the only significant predictor of both systolic and diastolic blood pressure, with increasing lifestyle incongruity being associated with higher blood pressures. For contextual effects, the results are consistent with our predictions, although the association was only statistically significant for systolic blood pressure. Having both spouses employed outside the home led to higher blood pressures for men but lower ones for women. Similarly, increasing lifestyle incongruity was associated with a small reduction in blood pressure for women but with a substantial increase for men.

These results suggest that the household is a contextual modifier for sex differences in the experience of sociocultural stressors. As the center of production and organization in Samoan life, the household conditions the division of labor. While Samoan men, as heads of households, have the authority to guide production within them, the primary male domain is the public sphere of politics and power. The lives of Samoan wives, on the other hand, center on the household. The value of a Samoan woman in traditional society was directly related to how well she fulfilled her responsibilities of household organization and presentability.

The results of this study corroborate the sex differences in Samoan response to lifestyle stressors reported by Janes (1990) and by Dressler and Bindon (1997). The primary concerns of Samoan men about acquiring public status and being involved in political affairs have carried over to non-traditional settings (Janes, 1990). While Samoan men in these non-traditional contexts still pursue traditional positions of prestige (e.g., *matai* status), success in these pursuits depends increasingly on the ability to meet American ideals of class and status.

Our results are different from those reported by Chin-Hong and McGarvey (1996)

for adults in Western Samoa. Using a lifestyle incongruity model, they report that for men under age 40, increasing lifestyle incongruity is associated with decreasing systolic blood pressure, while for women over age 40, increasing lifestyle incongruity is associated with increasing diastolic blood pressure. They argue very plausibly for an ethnographic interpretation of their results based on age and gender differences in Samoan society. They note that in Western Samoa, young men are still very much in service to their family and *matai*. For these men, frustration over the lack of control of resources is a likely explanation for their increasing blood pressure as their economic resources exceed their style of life (decreasing lifestyle incongruity). As Chin-Hong and McGarvey point out, what is happening to the excess resources in these cases is that they are used in service to the family (*'aiga*) at the discretion of the *matai*. The older women in their study consist of a highly truncated sample from age 40 to 64. It is highly likely that most of these women are not employed outside the home. In this sense they would correspond to the women from American Samoa in our study who live in households with one or neither spouse employed outside the home. As indicated in Figure 1a, these women had higher blood pressure than the working women with employed husbands. The association seen in Western Samoa may be a result of the underlying household context including employment status of the spouse.

It should be noted that there are significant differences in age, economic resources, and material style of life between Chin-Hong and McGarvey's Western Samoan sample and the sample from American Samoa discussed in this paper. Their sample ranged in age from 25 to 64 years, with a mean age of 38, while our sample ranged in age from 37 to 81, with a mean of 56. Because of the importance of age as a cultural modifier of lifestyle incongruity in Samoans (Bindon et al., 1991; Dressler and Bindon, 1997), we would anticipate differences between the samples. Furthermore, the style of life is very different in the two samples. As an example, 65% of the Western Samoan sample lived in one-room houses while 10% of

our American Samoan sample did; 70% of their sample cooked on traditional stone or wood fires while all of our sample had gas, electric, or kerosene stoves; 20% of their sample had televisions while 90% of ours did; 70% of their sample did not view television regularly compared to 16% of our sample; and 17% of their sample owned a vehicle vs. 54% in American Samoa. Similarly, the opportunities for employment are restricted in Western Samoa and relatively fewer women work outside the home in Western Samoa than in American Samoa. Because of these differences in the characteristics of the two groups of Samoans, the different results in the two studies are consistent with an understanding of the cultural context of lifestyle incongruity in the different settings.

A Samoan man's status is also supported by the role of his wife as domestic organizer. Employed men whose wives also work outside the home may experience more confusion over status role expectations than those whose wives stay home. A household in which both spouses work is suggestive of greater involvement in the market economy, and thus a more complete adoption of modern behaviors and thought patterns. The men in these households perhaps pursue lifestyles in accordance with a new cultural definition of status. However, especially in American Samoa, the new status symbols have not replaced the traditional *matai* system; instead, the display of consumer goods and behaviors has been incorporated as an additional level of status needed to earn traditional status. An employed wife presents a conflict with traditional meanings of status. Her complementary role, which involves supporting her husband's status through household responsibilities, is diminished. It can be argued, therefore, that men whose spouses work experience greater psychosocial stress and hence higher blood pressures because they lose a traditional component of status which increases their reliance on the modern symbols of prestige.

As women in developing societies are incorporated into the wage labor market, their gender role expectations may change drastically. Eviota (1986) notes that Filipino women are primarily responsible for house-

hold maintenance and child care so that engaging in economic activity puts constraints on a woman's time and energy as she tries to manage both. However, Detre (1984) points out that while it is intuitively expected that employment outside the home will take a toll on women's health, one should not ignore the important benefits of employment such as an additional social support network and additional income for the family.

Of course, whether or not employment is a significant stressor for women depends on the cultural context. In Samoa, the extended family system, although declining, provides some relief in domestic responsibilities for employed wives and mothers. The average household size in families with both spouses working is 6.7 (\pm 3.6, median = 6). Also, 93% of these households have at least one adult in addition to the working spouses, allowing them to follow the Samoan practice of having a relative who resides in the household to rely upon to take over some domestic chores and help with child care. Thus, while having a spouse working outside the home may increase psychosocial stress for a Samoan man, it may lead to a reduction in stress for the woman, leading to the pattern illustrated in Figure 1a. The results of this study imply that the psychological rewards that women receive for fulfilling their traditional roles are displaced in the market economy context. Whereas traditional household presentability meant appearance upkeep through daily chores, presentability has likely incorporated material display into its current meaning. By providing an extra income and thereby contributing to the consumption of material goods, a woman may feel satisfied that she is still caring for her household. The psychological rewards for employed women come when they fulfill their new gender role expectations by increasing the comfort level of themselves and their families.

Similarly, the lifestyle incongruity by sex interaction reflects the household context modifying stressors (Fig. 1b). In this case, it appears that the main impact of attempting to present an image of conspicuous consumption to the community that cannot be supported by family economic resources falls on

the Samoan men. By contrast, the material comfort afforded the family—whether or not in excess of economic abilities—appears to reduce stress for Samoan women, with their family-centric psyche as noted by Janes (1990).

In spite of its limitations, this study has highlighted several areas that are worthy of further exploration. The results presented here on modification of psychosocial stress by intracultural context are in need of confirmation on a more representative sample from American Samoa. In addition, there is substantial need for qualitative research, including the ethnographic investigation of male and female roles in households with different employment patterns. Such work could provide the cultural basis for the associations we have found in this investigation.

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